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(71) Applicant: **Encoret Limited**  
**Bray, County Wicklow (IE)**

(72) Inventor: **Bonadio, Frank**  
**Bray, County Wicklow (IE)**

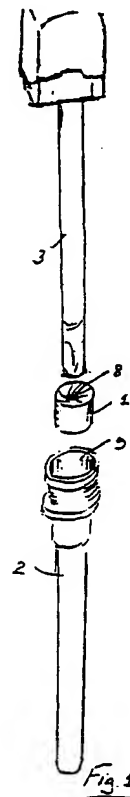
(74) Representative:  
**McCarthy, Denis Alexis et al**  
**MacLachlan & Donaldson**  
**47 Merrion Square**  
**Dublin 2 (IE)**

Remarks:

This application was filed on 31 - 10 - 1997 as a  
divisional application to the application mentioned  
under INID code 62.

### (54) A valve

(57) A valve (1) comprises an outer ring (5,6) and a  
sealing sleeve (7) of flexible material mounted to the  
ring (5,6) and extending into the opening defined by the  
ring to terminate in a substantially centrally disposed  
inlet opening (8). Through the opening (8) a member  
such as a trocar (3) or surgical instrument may be  
passed. The sealing sleeve (7) remains in sealing  
engagement with the member (3) as it is passed there-  
through.



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## Description

The invention relates to valve, and in particular to a valve for use with a trocar assembly.

Trocars are short pointed instruments used to puncture a body cavity. A cannula may be inserted into the opening created by a trocar to drain the fluids from the body. Trocars may also be used during endoscopic procedures. Trocar assemblies are described in US 4,601,710 and 4,654,030.

Because of the wide range of instruments which pass through trocar tubes or trocar assemblies, a large variety of different diameter tubes and instruments are required. Various attempts have been made to provide a valve to allow a range of different sizes of instruments to pass through a single trocar tube. These efforts to date however have not been entirely successful.

There is therefore a need for an improved valve particularly for a trocar tube or cannula which will overcome this problem. This invention is directed towards providing such a valve.

According to the invention there is provided a valve comprising an outer ring and a sealing sleeve of flexible material mounted to the ring and extending into the opening defined by the ring to terminate in a substantially centrally disposed inlet opening through which a member such as a trocar or surgical instrument may be passed, the sealing body remaining in sealing engagement with the member as it is passed therethrough.

In a particularly preferred embodiment of the invention, the sealing body is twisted into a substantially hourglass shape having a central opening through which a member is passed.

Preferably the ring comprises a pair of axially facing ring parts, opposite free ends of the flexible sealing sleeve being attached to the respective ring parts, one of the ring parts being rotated relative to the other to twist the sealing sleeve into a twisted sealing configuration and fixed relative to the other ring part in the sealing configuration.

The invention also provides a trocar tube or cannula incorporating a valve according to the invention.

The invention further provides a trocar assembly incorporating a trocar tube or cannula according to the invention and/or a valve according to the invention.

The invention will be more clearly understood from the following thereof, given by way of example only with reference to the accompanying drawings in which:-

Fig. 1 is a diagrammatic exploded perspective view of a trocar assembly incorporating a valve according to the invention;

Fig. 2 is a cross sectional view of a valve used in the assembly of Fig. 1;

Fig. 3 is a perspective view of a trocar tube incorporating the valve;

Fig. 4 is a cross sectional view of the trocar and valve in use;

Fig. 5 is a cross sectional view of a modified arrangement according to the invention in one position of use; and

Fig. 6 is a cross sectional view of the arrangement of Fig. 5 in another position of use.

Referring to the drawings and initially to Figs. 1 and 2 there is illustrated a valve according to the invention indicated generally by the reference numeral 1 which in this case is used in association with a trocar assembly comprising a trocar tube or cannula 2 and a trocar 3.

The valve 1 comprises an outer ring which in this case comprises a pair of axially facing ring parts 5, 6 and a sealing sleeve 7 of a flexible material, the free ends 7a, 7b of which are attached to the respective ring parts 5, 6.

To form the valve 1 according to the invention, typically one of the ring parts 5 is rotated relative to the other to twist the flexible sleeve 6 from a substantially cylindrical non-sealing configuration to an hourglass sealing configuration as illustrated particularly in Fig. 2 having a central opening 8 through which a member such as a trocar 3 may be inserted. The ring parts 5, 6 are retained in the sealing configuration illustrated in Fig. 2 by any suitable means such as by adhesive bonding or the like.

The valve 1 is typically housed in a seat 9 of a trocar tube or cannula 2. To pass a member such as a trocar 3, operating instrument 10 or the like through the valve 1 in a trocar tube or cannula 2, the trocar 3 is first offered up to the opening 8 in the sealing sleeve 7 and is pushed through the sleeve 7 by rotating the trocar 3 to ease the passage of the trocar through the sleeve by contra-rotating the sealing sleeve 7 against the sealing twist to enlarge the opening 8. As the trocar 3 passes through the sleeve 8 the sealing engagement is maintained.

A wide range of different size and types of members such as trocars or operating instruments may be readily passed through a single valve 1. For narrow members such as the instrument 10 illustrated in Figs. 5 and 6 a collar 15 may be provided around the instrument 10, the collar 15 engaging against the sealing sleeve 7 of the valve 1 to enlarge the opening 8 (see Fig. 5) allowing the collar 15 and instrument 10 to readily pass there-through (Fig. 6). In the inserted position a shoulder 16 of the collar 15 engages against a stop 17 on the tube 2. When it is desired to withdraw the instrument 10 from the trocar tube 2, the instrument is drawn back to the collar 15 and the collar 15 with the instrument 10 in frictional engagement therewith is drawn back through the flexible sealing sleeve 7.

There are many advantages of the valve according to the invention. For the particular surgical application

described, a single trocar tube may now be inserted into a body cavity allowing a wide range of different types and sizes of instruments to be inserted through the tube. Thus, there would be a reduction in the number of trocar assemblies required for a particular operation. In addition, because of the simplicity of construction and operation, the valve and trocar tube or cannula are readily sterilisable and consequently re-usable.

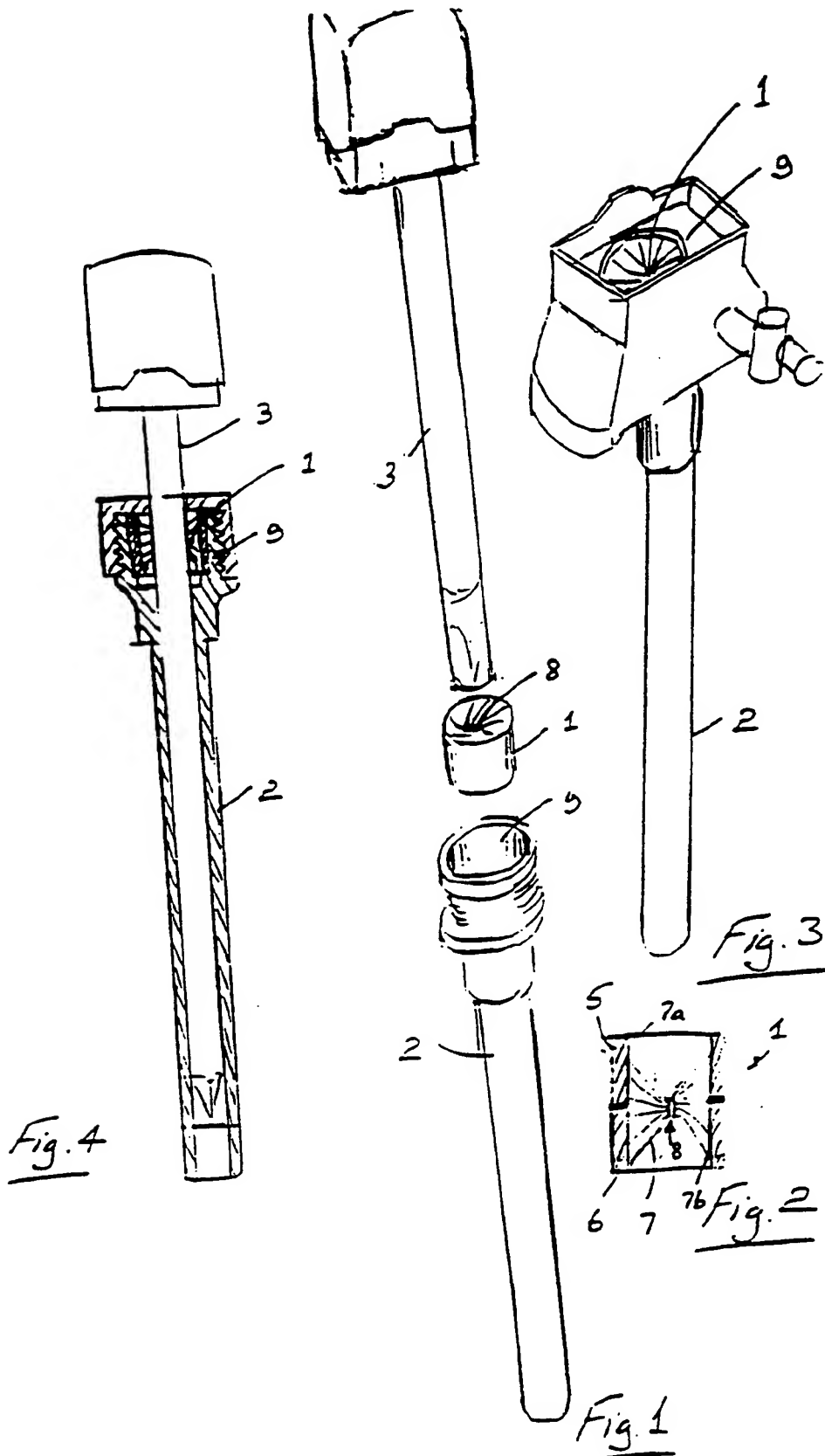
It will be appreciated that while the invention has been specifically described for use with a trocar assembly, it has many different applications and accordingly the invention is not limited to the application of the valve to a trocar tube, cannula or trocar assembly.

It will be appreciated that an additional entry aid may be provided as an alternative to or in addition to the collar just described. The additional sealing may be provided by a plurality of flexible segments extending inwardly on the inlet side of the valve, the segments being pushed forwardly on insertion of an instrument to engage against and open the valve to facilitate passage through the valve.

The invention is not limited to the embodiments hereinbefore described, which may be varied in construction and detail.

#### Claims

1. A valve comprising an outer ring and a sealing sleeve of flexible material mounted to the ring and extending into the opening defined by the ring to terminate in a substantially centrally disposed inlet opening through which a member such as a trocar or surgical instrument may be passed, the sealing body remaining in sealing engagement with the member as it is passed therethrough.
2. A valve as claimed in Claim 1 wherein the sealing body is twisted into a substantially hourglass shape having a central opening through which a member is passed.
3. A valve as claimed in Claim 1 or 2 wherein the ring comprises a pair of axially facing ring parts, opposite free ends of the flexible sealing sleeve being attached to the respective ring parts, one of the ring parts being rotated relative to the other to twist the sealing sleeve into a twisted sealing configuration and fixed relative to the other ring part in the sealing configuration.
4. A valve substantially as hereinbefore described with reference to the accompanying drawings.
5. A trocar tube or cannula incorporating a valve as claimed in any preceding claim.



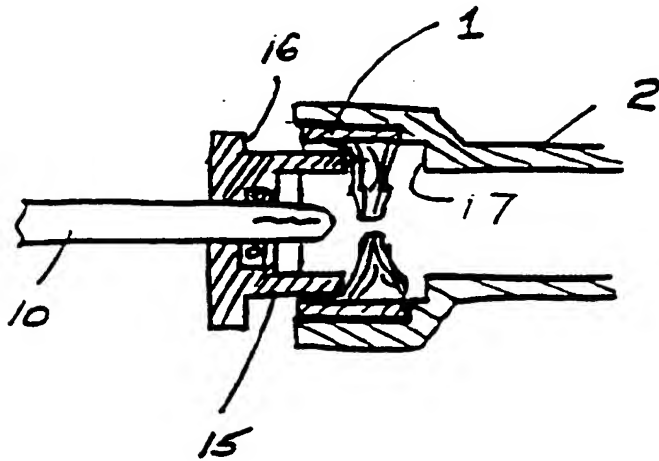


Fig. 5

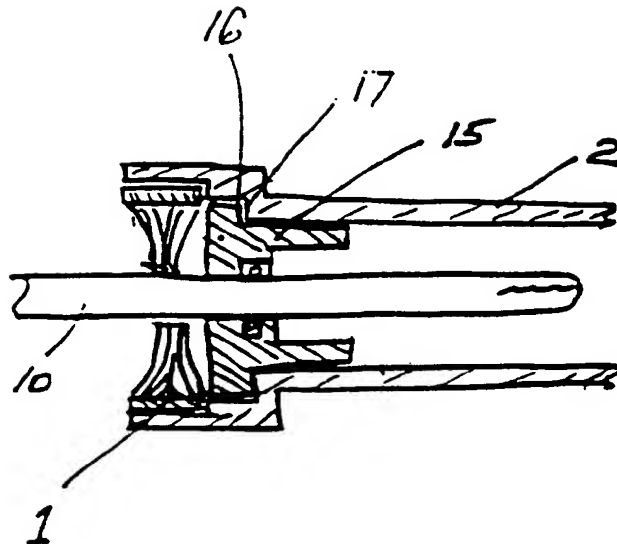
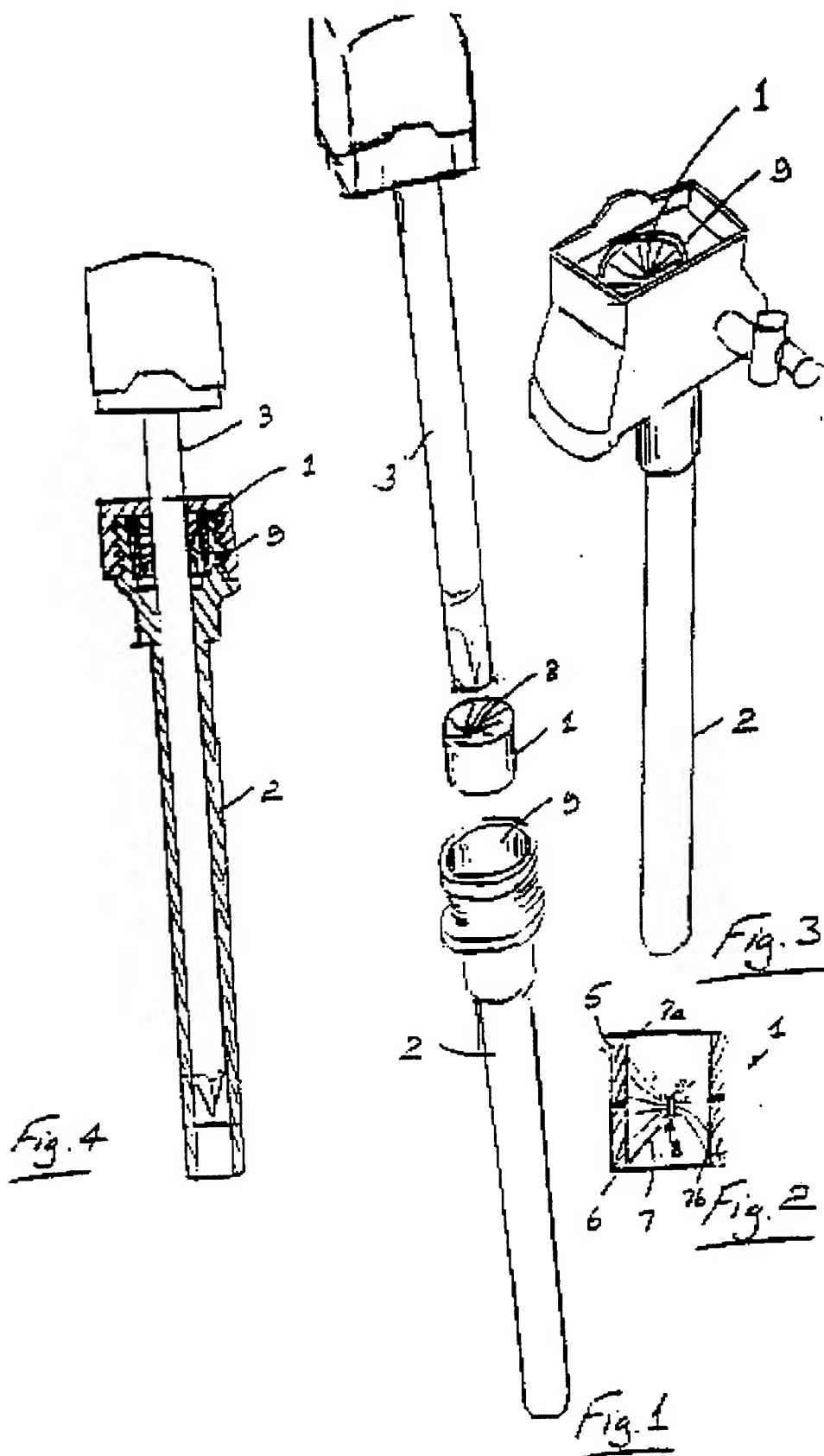


Fig. 6



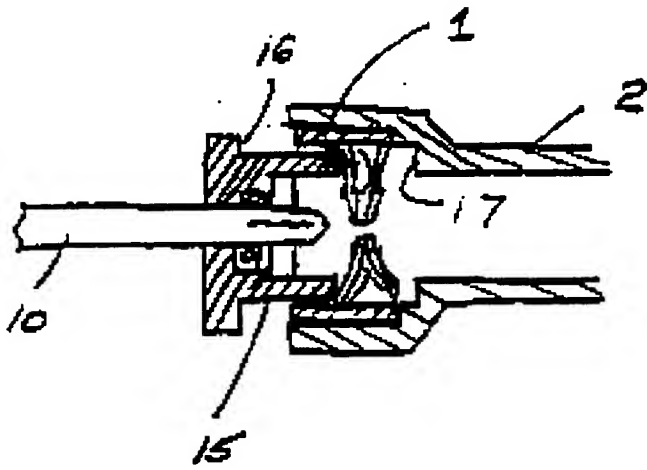


Fig. 5

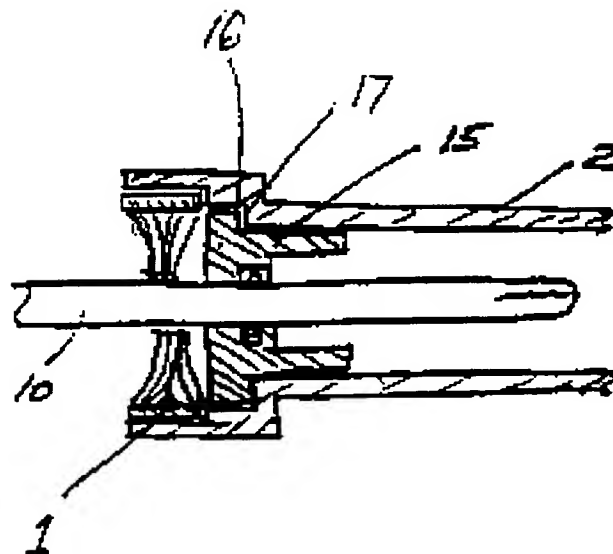


Fig. 6



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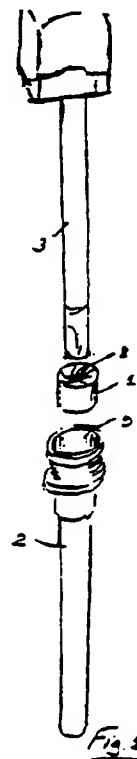
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# EUROPEAN SEARCH REPORT

Application Number  
EP 97 20 3376

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 211 370 A (POWERS RONALD J) 18 May 1993 * column 2, line 7 - line 63; figures 1-7 *	1-5	A61B17/00 A61B17/34
X	WO 92 11880 A (CARDIOPULMONICS) 23 July 1992 * abstract; figures 1-5 *	1-5	
X	US 4 580 573 A (QUINN DAVID R) 8 April 1986 * abstract; figure 1 *	1-5	
X	EP 0 546 712 A (ENDOVASCULAR TECHNOLOGIES) 16 June 1993 * abstract; figures 1,8 *	1-5	
X	EP 0 426 407 A (APPLIED VASCULAR DEVICES INC) 8 May 1991 * abstract; figure 1 * * column 10, line 58 - column 11, line 12 *	1,5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A61B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 November 1998	Examiner Moers, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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